

REMARKS

This Amendment and Response to Non-Final Office Action is submitted in response to the non-final Office Action mailed August 19, 2005. Claims 1-33 are pending in the Application. Claims 1-33 stand rejected under 35 U.S.C. 102(e) as being anticipated by Britton et al. (U.S. Patent No. 6,401,136).

In response to the above rejection, Claims 1, 12, and 23 have been amended to further clarify the subject matter which Applicants regard as the invention. These amendments are fully supported in the Specification, Drawings, and Claims of the Application and no new matter has been added. Based upon the amendments, reconsideration of the Application is respectfully requested in view of the following remarks.

Rejection of Claims 1-33 Under 35 U.S.C. 102(e) – Britton et al.:

Claims 1-33 stand rejected under 35 U.S.C. 102(e) as being anticipated by Britton et al. (U.S. Patent No. 6,401,136). Specifically, in regard to Claim 1, Examiner states that Britton et al. disclose a method, implemented by a communication coordinator on a module, for carrying out reliable communication in a system, comprising: receiving a message from a sender intended for one or more applications, said message comprising a message identifier; determining based upon said message identifier whether said message had previously been received; and in response to a determination that said message had previously been received, foregoing delivery of said message to said one or more applications. Examiner additionally states, in regard to Claim 12, an apparatus claim related to the method of Claim 1, that Britton et al. disclose an apparatus for implementing reliable communication in a communication system, comprising: a mechanism for receiving a message from a sender intended for one or more applications, said message comprising a message identifier; a mechanism for determining based upon

said message identifier whether said message had previously been received; and a mechanism for foregoing, in response to a determination that said message had previously been received, delivery of said message to said one or more applications. Examiner further states, in regard to Claim 23, that Britton et al. disclose a computer readable medium comprising instructions which, when executed by one or more processors, cause the one or more processors to implement reliable communication in a communication system, said computer readable medium comprising: instructions for causing one or more processors to receive a message from a sender intended for one or more applications, said message comprising a message identifier; instructions for causing one or more processors to determine based upon said message identifier whether said message had previously been received; and instructions for causing one or more processors to forego, in response to a determination that said message had previously been received, delivery of said message to said one or more applications. Claims 2-11, dependent claims dependent on Claim 1; Claims 13-22, dependent claims dependent on Claim 12; and Claims 24-33, dependent claims dependent on Claim 23, stand rejected for similar reasons.

In response to this rejection, Claim 1 has been amended to recite:

A method, implemented by a communication coordinator on a module, for carrying out reliable communication in a communication system, comprising:

receiving a message from a sender intended for one or more applications, said message comprising a message identifier;

determining based upon said message identifier whether said message had previously been received; and

in response to a determination that said message had previously been received, foregoing delivery of said message to said one or more applications;

wherein a message exchange between a sender and a receiver is conducted ensuring that a message is delivered to a recipient at most once.

Corresponding amendments have been made to independent Claims 12 and 23. These amendments are fully supported throughout the Specification, and specifically beginning on page 45 under the sub-heading "Reliable Communication," as is described in greater detail below.

Britton et al. disclose the communications between a source device and a destination device over a communications link by transmitting a message, with an associated sequence identifier transmitted with it, stored in a source persistent queue at the source device over the external communication link to the destination device, which Examiner asserts is equivalent to the present invention, a reliable communication mechanism.

Applicants submit, however, that the Britton et al. invention is not equivalent because the present invention provides that a message exchange between a sender and a receiver is conducted ensuring that a message is delivered to a recipient at most once. Britton et al. do not disclose an "at most once" delivery guarantee. Britton et al. disclose methods, systems, and computer program products to essentially serve as a checkpoint or restarting system. Duplicate messages occur.

For example, Britton et al. disclose in column 9 that "in the event of non-sequential transmission of messages, the largest number included in the persistent message queue 14 which is included in the commit message should be the largest sequence number of a continuous sequence of sequence numbers associated with a series of messages. Thus, for example, if sequence numbers 20, 21, 22, 23 and 27 were sent, then the largest sequence number would be 23 as it is the largest sequence number in a continuous sequence of sequence numbers." In this example, the resync of the commit messages would begin at 24 since 23 was the last sequence number of a continuous sequence of sequence numbers. Sequence number 27 will be resent when the queue is retransmitted beginning at sequence number 24, thus, a duplicate occurs. In the first

paragraph in Column 9, continued from Column 8, Britton et al. recognize this possibility: "In any event, the committed sequence number received in the message from the receiving device 20 is persistently stored at the sending device to indicate the highest sequence number which has been committed by the receiving device 20 (block 116). It may then be determined if the received message was a resync message from the receiving device 20 (block 118). If the message was not a resync message then the message was a commit message and control waits for the next event. If the message was a resync message then messages in the send persistent message queue 14 which have a higher sequence number than the committed sequence number received in the resync message are transmitted to the receiving device 20 (block 120). ***Some of these messages may be re-transmissions.***" (emphasis added)

It is an object of the present invention to prevent duplicate messages. This is noted clearly on page 45. "With reliable communication, there is a risk that a message will be delivered multiple times to a recipient. For example, suppose that a sender sends a message to a recipient, which is received and processed by the recipient. In response, the recipient sends an acknowledgment to the sender, but the acknowledgment is somehow lost and hence not received by the sender. Since an acknowledgment was not received, the sender will resend the message. If the message is again received and processed by the recipient, then the message will be processed twice. For certain implementations, such as database updates, this is a highly undesirable result. To overcome this problem, one embodiment of the CFM provides an ability to implement reliable communication with an "at most once" guarantee. That is, the CFM ensures that a message will be delivered no more than one time to a recipient."

Consider an example of the present invention using the data above from the Britton et al. disclosure for illustrative purposes. As described in detail in the Specification on pages 48 through 52 under the sub-heading "Sending and Receiving Reliable Communication" and as illustrated in Figure 2, a communication coordinator

204(1) creates a message packet which includes a generated sequence number. This message packet is routed using data from a reliable communication table 208(1) into a communications network and is routed to the communication coordinator 204(2) on another module. The communication coordinator 204(2) extracts data from the message packet and updates the reliable communication table 208(2). As is illustrated in Figure 7, the reliable communication table 208(2) includes data on sequence numbers, including a missing sequence number list. Using the data in the reliable communication table 208(2) and comparing it against the data in a message packet, the communication coordinator 204(2) determines the next action. Three scenarios may arise. Depending on whether the sequence number in the message packet is one number greater than the current receiving sequence number, whether the sequence number in the message packet is greater than the current receiving sequence number by more than one, or whether the sequence number in the message packet is smaller than the current receiving sequence number, a next action is determined.

Using numbers similar to the example provided in Britton et al., assume the sequence numbers 20, 21, 22, 23 and 27 were received by communication coordinator 204(2). When sequence number 27 is received by the communication coordinator 204(2), it is determined that the sequence number in the message packet is greater than the current receiving sequence number (which is 23) by more than one. This means that one or more intermediate messages were not delivered properly, here, sequence numbers 24, 25, and 26. In such a scenario, the communication coordinator 204(2) performs at least three operations. First, it adds the intermediate sequence numbers (e.g. 23, 24, and 26) to the Missing Sequence Number List column of entry 710. Second, it updates the entry 710 by storing the new sequence number (e.g. 27) into the Receiving Sequence # column. In addition, it delivers the message to the appropriate application component 202(2)(1)-202(2)(n) using a component reference. In this manner, the entry 710 is maintained/updated, and the message is delivered to the proper component 202(2)(1)-202(2)(n).

Assuming that a missing sequence number (one or more of sequence numbers 24, 25, or 26, in this example) is received by the communication coordinator 204(2), the sequence number in the message packet is smaller than the current receiving sequence number in entry 710. If that is the case, then it means that the message packet is being delivered out of sequence. To determine what actions to take, the communication coordinator 204(2) checks the missing sequence number list of entry 710. If the sequence number in the message packet is one of the numbers in the missing sequence number list, then it means that this message packet has not been received before. Thus, the communication coordinator 204(2) delivers the message to the appropriate application component 202(2)(1)-202(2)(n) using a component reference, in the same manner as that described previously. In addition, the communication coordinator 204(2) removes the sequence number in the message packet from the missing sequence number list of entry 710. In this manner, the entry is properly maintained/updated, and the message is properly delivered.

On the other hand, if the sequence number in the message packet is not one of the numbers in the missing sequence number list, then it means that this message packet has been received before, and hence, the message has already been delivered to the proper component 202(2)(1)-202(2)(n). That being the case, the communication coordinator 204(2) discards the message packet, and foregoes delivery of the message to any of the application components 202(2)(1)-202(2)(n). ***By doing so, the communication coordinator 204(2) prevents multiple deliveries of the same message. In this manner, the communication coordinator 204(2) enforces the "at most once" reliable communication guarantee.***

Claim 12 and Claim 23, both independent claims which correspond to the method in Claim 1, have been amended to reflect the changes made to Claim 1.

Claims 2-11 are dependent claims dependent on Claim 1. Claims 13-22 are dependent claims dependent on Claim 12. Claims 24-33 are dependent claims dependent on Claim 23.

Based on the same unique and novel features of the present invention as described above, namely that, as amended, Claims 1, 12, and 23 have unique and patentable novel features, precisely that they provide that a message exchange between a sender and a receiver is conducted ensuring that a message is delivered to a recipient at most once, it is respectfully asserted that these dependent claims are now in condition for allowance.

In addition, it is further noted that Britton et al. disclose an invention designed to allow "data to be more quickly available to applications communicating using the message queues." (Col. 3, lines 32-34) What Britton et al. disclose is a checkpoint or restarting system that prevents large streams of data from being resent by allowing the data stream to pick up where it can verify the last sequential message was received. In other words, when communications of a data stream is interrupted or disconnected, the entire data stream need not be resent in its entirety. This, however, does not prevent duplicate messages from being sent when data is received in a non-sequential order. Such duplicate messages may cause harm to the recipient applications. This invention, on the other hand, guarantees that a duplicate message will not be received even when data is received non-sequentially. This protects the integrity of the data maintained in the receiving applications.

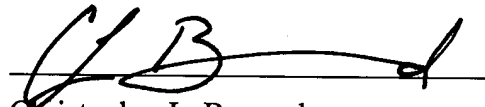
The differences between the invention of Britton et al. and the invention of the present Application are now made explicit in amended Claims 1, 12, and 23. Therefore, Applicants submit that the rejection of Claims 1-33 under 35 U.S.C. 102(e) as being anticipated by Britton et al. has now been overcome and respectfully request that this rejection be withdrawn.

CONCLUSION

Applicants would like to thank Examiner for the attention and consideration accorded the present Application. Should Examiner determine that any further action is necessary to place the Application in condition for allowance, Examiner is encouraged to contact undersigned Counsel at the telephone number, facsimile number, address, or email address provided below. It is not believed that any fees for additional claims, extensions of time, or the like are required beyond those that may otherwise be indicated in the documents accompanying this paper. However, if such additional fees are required, Examiner is encouraged to notify undersigned Counsel at Examiner's earliest convenience.

Respectfully submitted,

Date: November 17, 2005



Christopher L. Bernard
Registration No.: 48,234
Bradley D. Crose
Registration No.: 56,766
Attorneys for Applicants

DOUGHERTY CLEMENTS
1901 Roxborough Road, Suite 300
Charlotte, NC 28211 USA
Telephone: 704.366.6642
Facsimile: 704.366.9744
cbernard@worldpatents.com